The State Pipeline Mapping System
Operator Submission Standards

California Resources Agency
Department of Forestry and Fire Protection
State Fire Marshal
Pipeline Safety Division

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1 Contacts

If you have any questions regarding this document, or the requirements described here, please contact one of the representatives from the State Fire Marshal Pipeline Safety Division. The division phone number is (916) 445-8477.

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National Pipeline Mapping System

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Internet Addresses

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CA Department of Forestry www.fire.ca.gov
State Fire Marshal http://osfm.fire.ca.gov
U.S. Geological Survey www.usgs.gov

2 Introduction

The State Pipeline Mapping System is a Geographic Information System (GIS), housed in the California State Fire Marshal's (SFM) Pipeline Safety Division. Created by State AB 592, the State Pipeline Mapping System's intent is to map all SFM jurisdictional pipelines. The State Fire Marshal will then integrate pipeline information with Public Drinking Water Well information, furnished by the California Department of Health Services, in order to identify all pipelines within 1000 feet of public drinking water wells. Once pipelines are identified, the operators of those pipelines will be notified and required to submit a Wellhead Protection Plan for the well(s) within 1000 feet of the pipeline they operate.

The standards for the State system reflect the National Repository standards. There are three small deviations between the systems. The State system requires both AGE and DIAMETER attributes. The State system has a positional accuracy standard goal of +- 100 feet rather than the national +- 500 feet. Finally the state system does NOT require Natural Gas Lines or Liquefied Natural Gas facilities.

This document will outline the National Pipeline Mapping Standards and describe in detail the Age data standards. Operators should follow *the National Pipeline Mapping System Standards* in all cases except age, diameter and positional accuracy. For the full national standards please see www.npms.phmsa.dot.gov

What is a GIS?

A Geographic Information System (GIS) will be used as the data repository and analysis method. A GIS is a system of computer hardware, software and people that stores, retrieves, inputs, outputs and analyzes spatial data in order to make better decisions. There are two unique components about GIS. Component 1 is spatial representation of features in the world. In this case those features are lines, which represent pipelines. Each linear feature in the GIS has the real world coordinates of where that pipeline actually exists on the ground within some spatial accuracy. Many line segments can make up one pipeline. Component 2 is the attribute or data base information about the features (i.e. pipelines) in the spatial component. The data base component contains rows and columns like any database. Each column represents a new attribute like length, diameter, operator, age, or inspection history. Each record represents one feature in the spatial component. In fact each spatial feature is integrally connected to each record in the database, and vise versa. This connected relationship allows for both spatial and attribute query and analysis.

3 Data Standards

Diameter and Age

Diameter is a required field in the State Pipeline Mapping System. For all submissions, follow the *National Pipeline Mapping System Standards*, and populate diameter for all records.

Pipeline age is a required field from Legislation AB 592. While pipeline age might be confusing due to pipeline section updates, or replacements, the SFM will implement a robust Geographic Information Systems solution to this attribute problem. The solution requires three components. Component 1 is a consistent pipeline identification number for the entire pipeline. Component 2 is identification of a pipeline beginning point (node) and ending point (node). Component 3 is measured distance of each of the age sections for the entire pipeline. SFM is asking for age determination for only those contiguous sections of pipeline greater than 1000 feet (305 meters). This Section will describe each component and how to meet the requirements for the age attribute submissions.

Component 1, the CSFM pipeline identification number is satisfied by the PLINE_ID item listed in the National standards. Operators must transfer this attribute to a new table (see **Table 1**). **(See Exhibit 3-1.** *National Pipeline Mapping System Standards***)**

Component 2, pipeline starting and ending points must be satisfied in the geospatial submission. All lines, either paper or electronic, must have points (nodes) indicating the starting and ending locations of lines. Operators submitting pipeline data must identify one Starting Node and one Ending Node per PLINE_ID. The Starting Node must be consistent with direction of pipeline flow. That is pipeline flows away from the starting node and to the ending node.

Component 3 is the actual measured distance from the starting node and the length of the age segment. Age will begin at a measured linear distance FROM the starting node and have a length associated with it. Operators will submit a table (**Table 1**) populated with the CSFM PLINE_ID, the year the pipe was built or replaced, a year status indicating built or replaced, and the linear distance from the starting node to the place that age ends. For paper submissions, identify the beginning and ending nodes by marking on the map “FROM” where the starting node is and “TO” where the ending node is. Then go to step 3 of the Directions for Populating Age Attributes. For electronic submissions, identify the beginning and ending nodes with a single attribute for the node feature class as shown in **Table 2**. Then begin at step 1 of the Directions for Populating Age Attributes. For Arc/Info users, this reflects standard route/event topology, where the beginning node marks the beginning of a Route and Table 2 is an event table.

As an example, if a pipeline has 3 different age sections, measure the linear distance of EACH contiguous age section (over 1000 feet) from the starting node and calculate the length of each age section, giving you 3 records as shown in **Exhibit 3-1**. In the case of the entire pipeline being the same age, the age length will be the length of the entire pipeline (1 record).

Directions for Populating Age Attribute:
Use the following flow chart to populate **Table 1**.
Begin by ensuring Starting and Ending Nodes are identified in the geospatial submission.

1) Is the entire pipeline you are submitting the same age?
   If YES, populate one record in the table, where PLINE-ID is the CSFM Line id number, YEAR is the year the pipeline was built (or replaced), YEAR-STATUS (B,P,R), and calculate FROM = 0 and LENGTH = the length of the pipeline
   If NO, proceed to #2.

2) Can you measure the linear distance in **meters** for the age of each different section? NOTE: Must match projection measurement units.
   If YES, populate **Table 1**. Populate as many records as different age sections all with the same PLINE-ID. For each different section populate YEAR and YEAR-STATUS. Populate the measured distance from the beginning node in FROM and the length of this age section in LENGTH. **(in METERS)** as shown below.

Exhibit 3-1

ID	PLINE-ID	YEAR	YEAR-STATUS	FROM	LENGTH
1	4123	1989	R	0	300
2	4123	1976	B	300	600
3	4123	1983	R	900	500

   If NO, proceed to #3

3) Create a paper map of the pipeline, using the National Pipeline Mappings System hard-copy submission standards as a guideline (Section 4.3 NPMS). Mark the sections of known age for each pipeline. Clearly write above and in the middle of each section the PLINE_ID and the YEAR in which the pipeline was built or replaced. Clearly indicate the YEAR-STATUS with a capitol B or R. Draw nodes as small diamonds to indicate a change in age section. The SFM will measure the linear distance for the age sections.

Exhibit 3-2

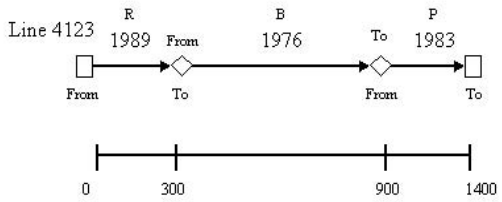

Table 1 CSFM Age Table (Required)

Field Name	Field Type	Field Length	Short Description	Full Description	Acceptable Values	Required Field
ID	I	5	Unique ID	Link between geo-spatial and attribute data. Assigned by the operator	Positive Integer	Y
PLINE-ID	I	4	Line ID	Unique CSFM Line Identification number.	Positive Integer	Y
YEAR	I	4	Year	Year the section of pipeline was built of replaced	Positive Integer	Y
YEAR-STATUS	C	1	Year Status	The status code for the section of pipeline. (B)uilt, (R)eplaced	B,R	Y
FROM	I	5	From Distance	The distance from the beginning of the pipeline (where flow begins or is pumped), to where the age changes, in **METERS**, for pipe sections greater than 1000 feet (305 meters)	Positive Integer	Y
LENGTH	I	5	Length	The length of this age section , in **METERS**	Positive Integer	Y

Table 2 Node Attribute Table, for spatial electronic data submissions only

Field Name	Field Type	Field Length	Description	Acceptable Values	Required Field
Arc#	I	5	Random Arc number the node is Attached to	Positive Integer	Y
<Internal>#	I	5	Internal number of the node	Positive Integer	Y
<Internal>-id	I	5	Internal user assigned node number	Positive Integer	Y
Type	C	10	Type of node, either START or END	START, END	Y

Attribute

Attribute information is defined as tabular data, in this case, about pipelines. Attribute data is significantly different from spatial data in that attribute data just contains the data base information (i.e. row and columns). There is, however, a unique relationship between the attribute data and the spatial data. Each record in the database defines one spatial feature, and vise versa. Therefore, there must be an equal number of records in the database as there are linear features in the spatial component. The state standard matches the national standard exactly, except for the additional attribute of age and diameter. For the complete national standard see www.npms.phmsa.dot.gov.

Data must be delivered with attributes formatted in the NPMS structure for inclusion in the State Pipeline Mapping System. Data will be accepted either as part of a GIS export, or with the *Attribute Data Template* provided by the National Pipeline Mapping system (See Section 3.4 *National Pipeline Mapping System Standards*).

Spatial Data

Each operator must submit geospatial data as described in the National Pipeline Mapping System Standards. Each pipeline must be represented by a linear feature. Polygon features will not be accepted. Due to the Age requirement, direction of the line will mark direction of the pipeline flow. In the case of multiple flow pipelines, the direction of the line should point in the primary flow direction.

The spatial entity will connect to the attribute table (Section 4 *National Pipeline Mapping System Standards*) through the LINK_ID item.

For Paper Submissions

Pipelines must be drawn on standard USGS 1:24 000 maps, or equivalent quality maps of larger scale and geographic control.

For Electronic Submissions

Pipelines must be in a standard GIS format. Accepted formats are:

- Arc/Info e00
- ArcView Shapefile
- Intergraph File
- MapInfo v3 or higher
- AutoCad
- Small World

Accuracy

Accuracy standards will be enforced for both spatial and attribute data. If any attribute data deviates from the National Standards, State Fire Marshal Staff will first try to correct the deviation. If the only solution will require significant data changing, the submission will not be accepted. Data deemed unacceptable will be returned to operators for correction and subsequent resubmission. Attribute data quality must be ensured and will go through a rigorous quality control process.

Attribute data accuracy will be implemented in a two-part process. Part one will ensure all attributes are in the format stated in the *National Pipeline Mapping System Standards*. Part two will ensure that attribute values submitted are acceptable values. To aid in this process the SFM will implement a feed back loop process whereby operators will receive all or some portion of their data and a standard map product back in for quality control purposes.

Spatial data accuracy will meet or exceed United State Geologic Survey spatial data standards for 1:24,000 scale topographic quadrangle maps. That standard states, "90 percent of well-defined features are to be within 0.02 inches of true mapped ground position." (USGS, *Standards for Digital Line Graph*, (mapping.usgs.gov/standards/index.html.) USGS 1:24000 scale standard meets the SFM's required positional accuracy goal of +- 100 feet.

To aid in this type of quality control, we will have a feedback loop process, which will ensure the highest possible spatial accuracy. All data will be entered into the California State Fire Marshal Pipeline Safety Division's Geographic Information System computer. Data that arrives in paper form will be digitized using Arc/Info software. The digitizing process will have root mean square errors associated with each paper map. RMS errors grater that 0.03 inches (at 1:24 000) will not be accepted. Digital data will be transformed into Arc/Info format if it is not already in that format. Check plots will be made with digital data and compared against existing digital data of known accuracy. Check plots will be mailed to the operators for them to sign off on. Only when we receive written clarification from operators, confirming the positional accuracy of check plots will the pipeline data be checked into the State Pipeline Mapping System library.

Metadata

Metadata submissions must be made with each data submission. Use the *National Pipeline Mapping System Standards Metadata Template* (Section 6 *National Pipeline Mapping System Standards)*. www.npms.phmsa.dot.gov, Data Requests & Downloads.

4 Submission Standards

This section will reiterate the National Pipeline Mapping System submission standards. Part I of this section will describe Paper Submissions and Part II will describe Electronic Submissions. Part I will address Scale, Projection, Geographic Control, Color and Symbology, Legend, Facility Labeling, Attribute Data, Linkage, Edgematching, and Metadata. Part II will address Format, Projection, Linkage, Topology, and Metadata. For a complete list of the National Standards see www.npms.phmsa.dot.gov

Paper Submissions

Pipelines must be delineated on standard USGS 1:24000 scale maps as line features, or a map of similar quality or larger scale. For overlay submissions, there must be four tic (+) marks on the overlay which match exactly with the four corners, or marks of similar geographic control of the map they are portraying.

Scale

Must meet or exceed USGS 1:24000 scale maps. Smaller scale maps will not be accepted. Larger scale maps will only be accepted if they also meet the rest of the standards. USGS 1:24000 scale maps will be accepted in all cases.

Projection

Projection information must be clearly written on the map. Projection definitions must contain at least the projection, datum, and units.

Geographic Control

For maps other than USGS 1:24000 scale, there must be at least 4 know points of geographic control marked and labeled on the map clearly.

Color and Symbology

Features to be included in the State Mapping System must be clearly delineated with a thin solid line using indelible ink and reasonably identified in the legend and with text above the line. Make certain the PLINE-ID is on the map.

Legend

All features on the map must have a legend clearly identifying the nature of each feature.

Facility Labels

All pipeline facilities must be labeled clearly.

Attribute Data

The Attributes must be outlined on a page with rows and columns delineated. Each column must have the field title printed clearly on the top of each page and be in the same order as Tables 1 and 2. Each record must have a unique record number on the far left-hand column.

Linkage

There must be a LINK_ID clearly written on the map identifying which pipeline the map represents. This MUST be the same LINK_ID number as in the attribute data.

Edgematching

If maps are submitted in multiple sheets, the pipelines must match across sheet boundaries.

Metadata

A complete metadata file must exist for each paper data submittal. Metadata must be in the *Metadata Template* format provided by NPMS.

Electronic Submissions

Electronic submissions will be accepted if they meet the following conditions. Electronic submissions must be on an acceptable media format, free from virus, and meet the standards set forth in the National Pipeline Mapping System below.

Format

Electronic files must be one of the accepted files listed in the National Pipeline Mapping Systems Standards. In all cases, clearly state the datum, coordinate system/projection and measurement units. Acceptable files types are: Arc/Info .e00, ArcView Shapefile, Intergraph, MapInfo, AutoCad, Small World.

Projection

Electronic files must have an associated projection file listing the known projection, datum and units the spatial data is projected in.

Linkage

Each spatial feature must be linked clearly to an individual attribute record, with a complete set of attributes.

Topology

Electronic files must be topologically sound, and contain no extraneous spatial features.

Metadata

A complete metadata file must exist for each electronic data submission. Metadata must be in the *Metadata Template* format provided by NPMS.

File Naming Conventions

All electronic files should follow the national standard file naming conventions (Section 2.1 *National Pipeline Mapping System Standards*).

Quality Procedures

After the SFM receives and inputs all data, we will perform several in-house quality control procedures to ensure completeness and correctness in both spatial and attribute characteristics. Spatial accuracy will be ensured through a rigorous registration process. Attribute completeness will be ensured through an application checking each entered record for properly entered values. The SFM will then output the spatial and attribute information in a standard format and mail this format back to the submitting operator for visual quality control. The submitting operator will perform visual quality control, mark comments on these standard maps and return to the SFM for entry in the State Mapping System library. The process will continue until the operator verifies both the spatial and attribute information.

Age Submission Form

ID	PLINE-ID	YEAR	YEAR-STATUS	FROM	LENGTH

Operator Name: _____ Pipeline: _____
Contact Name: _____ Contact Phone: _____
Contact email: _____ Contact Fax: _____
Company Address: _____
_____
_____

OPERATOR SUBMISSION CHECKLIST

ATTRIBUTE DATA

- ☐ Have all required fields in each feature attribute record been completed?
- ☐ Does each attribute record have a unique link to its line or point element in the geospatial file on the map?
- ☐ Has the attribute data been created and formatted according to the NPMS standard?
- ☐ Does each geospatial element have an attribute record?
- ☐ Is there a properly populated Age and Diameter Table as specified in the State Standards?

GEOSPATIAL DATA - Paper Submissions

- ☐ Are the maps USGS 1:24,000 topographic quadrangle or other NPMS approved base maps?
- ☐ Have the maps been checked for scale and accuracy?
- ☐ Have the features been drafted on the map according to the NPMA standard?
- ☐ Have the maps been edgematched?
- ☐ Are the features identified and clearly labeled on the map?
- ☐ Are the features distinguishable from each other on the map?
- ☐ Does each map contain a legend and a title identifying operator name and symbology used?
- ☐ Is Age clearly defined on the map, as described in the State Standards?

Digital Submissions

- ☐ Have the features been digitized according to the NPMS standard?
- ☐ Are the linear features continuous without gaps or overshoots?
- ☐ Does each feature have a complete attribute record as defined in the NPMS standard?
- ☐ Has the attribute record been uniquely linked to the point or line feature?
- ☐ Has the digital file been projected to the correct units and datum as stated in the NPMS standard?
- ☐ Has the submission file been exported and formatted according to the NPMS standards?
- ☐ If the attribute data is in a separate file, has this file been exported according to the standard?
- ☐ Are the data files being submitted on media approved by NPMS?
- ☐ Are the submitted data file names descriptive and unique, following NPMS guidelines?
- ☐ Are all of the geospatial files included in this submission?
- ☐ Is there an Age Table with populated records as described in the State guidelines?

Metadata

- ☐ Use the *NPMS Metadata Template* software.
- ☐ If using the NPMS supplied paper transmittal form, have you answered all of the questions?
- ☐ Is the contact information current?
- ☐ Has the file name of the digital metadata file been entered into the attribute data records?
- ☐ Are the required sections of the metadata completed?

Data Transmittal Form

Operator and Data Description

1. Pipeline operator name:

2. Date you submitted:

Hardcopy: Maps: _____ Attributes: _____ Metadata: _____

Digital: Geospatial: ___ Filename: _____
Attributes: ___ Filename: _____
Metadata: ___ Filename: _____

3. Briefly describe the contents of the data set. For paper, describe the features drawn on the map. For digital, list the files and the general contents of the files:

4. When was the data originally drafted, digitized, or scanned?

5. When was the data submitted last modified?

6. How up to date is the submitted data compared to the actual field conditions?

7. List the counties and cities covered by the submitted data:

8. What kind of quality checks did you perform on the submitted attribute data? Please describe how the attribute were obtained and checked for correctness and proper linking to the spatial data:

9. What kind of quality checks did you perform on the line/point data?

10. For the NPMS requested data, are there any parts of the data that were generalized, omitted, required significant editing, edge-matched, etc? If so explain briefly:

11. The pipelines positional accuracy is within (mark only one):

    ____ Less than 50 feet
    ____ 50 to 300 feet
    ____ 301 to 500 feet
    ____ 501 to 1000 feet
    ____ Unknown

12. Briefly explain how you determined the positional accuracy value in Question 11:

13. For digital data submissions, what is the computer hardware/software (including versions) and operating system used in creating this data set? What is the size of this data set?

Source Material Description
This section gathers information on the base maps or digital data used to prepare this NPMS submission. ***Note:*** For the following section, if you have more than one data source, please duplicate this page and complete for each source. You do not need to submit source material descriptions for individual USGS quad sheets.

14. What is the name of the organization or individual that created the source material?

15. What is the date(s) of the source material?

16. What is the source material (e.g. a map, GPS data, survey, production reports)?

17. What is the source material on (e.g. paper, mylar, diskette, cartridge tape, CD-ROM)?

18. How up to date is this source material compared to actual field conditions that it is supposed to represent?

19. Briefly describe how you processed the source material and incorporated it into creating or modifying this data set:

20. What is the datum of the source?

    ____ NAD83 (North American Datum)
    ____ NAD27
    ____ Other

21. What is the scale of the source material (e.g. 1:24,000)?

    1: _____

Contact Information

Technical Information Contact:

Name:

Company:

Mailing Address:

Phone Number:

Fax Number:

E-mail Address:

Transmittal Form Contact (if different from technical contact):

Name:

Company:

Mailing Address:

Phone Number:

Fax Number:

E-mail Address: